



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/271,469	03/17/1999	PONANI GOPALAKRISHNAN	YO998-152	4194

7590

08/24/2004

PAUL J. OTTERSTEDT
INTELLECTUAL PROPERTY LAW DEPT.
IBM CORPORATION
P.O. BOX 218
YORKTOWN HEIGHTS, NY 10598

EXAMINER

SPOONER, LAMONT M

ART UNIT

PAPER NUMBER

2654

DATE MAILED: 08/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/271,469

Applicant(s)

GOPALAKRISHNAN ET AL.

Examiner

Lamont M Spooner

Art Unit

2654

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 July 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 42-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 42-47 and 60 is/are allowed.
- 6) ☒ Claim(s) 1-12 and 48-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 March 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 07/06/2003 have been fully considered but they are not persuasive.

Regarding **claim 1**, Applicant states in the amendment, on page 13 last paragraph, lines 1-6 and page 14 first paragraph, lines 7-9, Kanevsky '091 does not disclose generating word form components in at least one of the subsets by splitting word forms having frequencies less than a threshold, and generating a language component vocabulary VC comprising word forms and word form components, as essentially claimed in claim 1.

However, Kanevsky et al. teaches splitting word forms having frequencies less than a threshold, C.4.lines 58-63, and generating a language component vocabulary VC comprising word forms and word form components, C.4.lines 18-22 "A first component of an integer vector may be referred to as a "stem" and a second component as an "ending" and, thus, the map T_m may be considered as a "split" of words using "idealized" vocabulary of integers. The vocabulary of word forms and word form components are created, and further represented as "idealized" vocabulary of integers", C.2.lines 18-25 "This assignment of integer vectors to word forms can be thought of as the splitting of word forms into a tuple of sub-words (e.g. prefix/stems/ending), numerating all these sub-words and thus getting tuples of indexed integers. It is to be understood that a "tuple" refers to an ordered set of components. For instance, 4-tuple of integers may be a set: (5, 2, 10, 120), while a 6-tuple of sub-words may be a set: (us,

Art Unit: 2654

ed, in, speech, reco, gnition)", the generated language component vocabulary VC comprises word forms and word form components, which are simple represented as integers.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4, and 48-51 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanevsky et al. (U.S. Patent No. 6,073,091 filed Aug. 6, 1997).

As per **claims 1 and 48**, Kanevsky et al. discloses a method for generating a language component vocabulary VC for a speech recognition system having a language vocabulary V of a plurality of word forms, the method comprising the steps of:

partitioning the language vocabulary V into subsets of word forms based on frequencies of occurrence of the respective word forms (C.3.lines 52, 53); and

in at least one of said subsets, splitting word forms having frequencies less than a threshold to thereby generate word form components (C.4.lines 58-63); and

generating a language component vocabulary VC comprising word forms and word form components (C.4.lines 18-22 "A first component of an integer vector may be referred to as a "stem" and a second component as an "ending" and, thus, the map Tm

may be considered as a “split” of words using “idealized” vocabulary of integers. The vocabulary of word forms and word form components are created, and further represented as “idealized” vocabulary of integers”, C.2.lines 18-25 “This assignment of integer vectors to word forms can be thought of as the splitting of word forms into a tuple of sub-words (e.g. prefix/stems/ending), numerating all these sub-words and thus getting tuples of indexed integers. It is to be understood that a “tuple” refers to an ordered set of components. For instance, 4-tupel of integers may be a set: (5, 2, 10, 120), while a 6-tuple of sub-words may be a set: (us, ed, in, speech, reco, gnition)”, the generated language component vocabulary VC comprises word forms and word form components, which are simple represented as integers.).

As per **claims 2 and 49**, Kanevsky et al. discloses all of the limitations of claim 1, upon which claim 2 depends. Kanevsky further discloses:

the frequencies of the word forms are estimated from a given textual corpus (C.4.lines 13, 14).

As per **claims 3 and 50**, Kanevsky et al. discloses all of the limitations of claim 1, upon which claim 3 depends. Kanevsky et al. further discloses:

said portioning step includes the sub-step of numerating the plurality of word forms in the language vocabulary V in descending order based on the frequencies associated with each of the plurality of word forms (C.4.lines 10-14).

As per **claims 4 and 51**, Kanevsky et al. discloses all of the limitations of claim 1, upon which claim 4 depends. Kanevsky et al. further discloses:

said partitioning step partitions the language vocabulary V into at least two subsets S1 and S2, and said splitting step splits the word forms of subset S2 into 2-tuple components including stems and endings, but does not split the word forms of subset S1 (C.4.lines 58-63).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5, 7-12, 52 and 54-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanevsky et al. (U.S. Patent No. 6,073,091, filed Aug. 6, 1997) in view of Kanevsky et al. (U.S. Patent No. 5,835,888 Nov. 10, 1998).

Kanevsky et al. and Kanevsky et al. are analogous art in that they are both involve language modeling for speech recognition.

As per **claims 5 and 52**, Kanevsky et al. (U.S. Patent No. 6,073,091) discloses all of the limitations of claim 4, upon which claim 5 depends. Kanevsky further discloses:

a splitting step comprising 3-tuple components (C.4.lines 26-28, 30, 31)

Kanevsky et al. does not disclose:

further partitioning the language vocabulary V into a third subset S3, with word forms therein being split in said splitting step into 3-tuple components including prefixes, stems and endings.

However, as it is well known in the art, Kanevsky et al. (U.S. Patent No. 5,835,888 Nov. 10, 1998) teaches partitioning the language vocabulary V into a subset that includes prefixes, stems, and endings (C.4.lines 18-20). Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Kanevsky et al. for the purpose of increasing the component size in a vocabulary set which would have increased the recognition of larger words that included a prefix, stem and ending while decreasing the size of dictionary needed to match these words.

As per **claims 7 and 54**, Kanevsky et al (U.S. Patent No. 6,073,091) discloses all of the limitations of claim 1, upon which claim 7 depends. Kanevsky et al. further discloses:

said splitting is performed using a fixed vocabulary (C.4.lines 14, 15-N=400,000);

Kanevsky et al. does not disclose:

a fixed list of allowable endings, with each word from the fixed vocabulary being split into at least a stem and an ending that is an element of the fixed set of endings.

However, as it is well known in the art, Kanevsky et al. (U.S. Patent No. 5,835,888) teaches having a fixed list of endings and each word from the vocabulary being split into a stem and an ending that is an element of the fixed set of endings (C.5.lines 9-13). Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Kanevsky et al. for the purpose of having a limit to the amount of vocabulary and stem and ending sets which would increase the processing time for a query into which word is to be recognized.

As per **claims 8 and 55**, Kanevsky et al (U.S. Patent No. 6,073,091) and Kanevsky et al. (U.S. Patent No. 5,835,888) disclose all of the limitations of claim 7, upon which claim 8 depends. Kanevsky et al. (U.S. Patent No. 6,073,091) does not disclose:

the fixed set of allowable endings includes an empty ending;

However, as it is well known in the art, Kanevsky et al. (U.S. Patent 5,835,888) teaches having a list of allowed endings that includes empty endings (C.3.lines 50-54). Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Kanevsky et al. for the purpose of having a limit to the amount of vocabulary and stem and ending sets and having an empty ending for the case where the stem doesn't have an ending which would increase the processing time for a query into which word is to be recognized.

As per **claims 9 and 56**, Kanevsky et al (U.S. Patent No. 6,073,091) discloses all of the limitations of claim 1, upon which claim 9 depends. Kanevsky et al. does not disclose:

generating and storing a word for to corresponding word form components table;

However, as it is well known in the art, Kanevsky et al. (U.S. Patent No. 5,835,888) teaches generating and storing a word form and its stem and endings in a table (C.3.lines 50, 51). Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Kanevsky et al. for the purpose of efficiently managing the word forms to word form components for further processing.

As per **claims 10 and 57**, Kanevsky et al (U.S. Patent No. 6,073,091) and Kanevsky et al. (U.S. Patent No. 5,835,888) disclose all of the limitations of claim 9, upon which claim 10 depends. Kanevsky et al. (U.S. Patent No. 6,073,091) does not disclose:

labeling each of the word form components stored in said table to distinguish between stems, prefixes and endings;

However, as it is well known in the art, Kanevsky et al. (U.S. Patent 5,835,888) teaches labeling the word components in the stored table to distinguish between components (Fig. 3A-the prefix, root/stem, and end are labeled). Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Kanevsky et al. for the purpose of not confusing the tags associated with each segment of the word form.

As per **claims 11 and 58**, Kanevsky et al (U.S. Patent No. 6,073,091) discloses, all of the limitations of claim 1, upon which claim 11 depends. Kanevsky et al. (U.S. Patent No. 6,073,091) further discloses:

generating a map of said word forms to said word form components (C.4.lines 30-36,-"...word forms are mapped into corresponding stem and ending numbers."-the numbers are interpreted as the components), said map further including each of a plurality of no-split words as being associated with itself (C.4.lines 59, 60);

Kanevsky et al. (U.S. Patent No. 6,073,091) does not disclose:

filtering a textual corpus using the map to generate a textual component corpus containing the non-split word forms and the word form components of the map.

accumulating the word form components and the non-split word forms generated by said filtering step in an n-gram language model; and

determining counts of n-tuple sets of word form components and word forms to estimate n-gram probabilities for the n-gram language.

However, as it well known in the art, Kanevsky et al (U.S. Patent No. 5,835,888) teaches filtering a textual corpus using the map to generate a textual component corpus (C.4.lines 18-20-the sub-vocabularies is interpreted as the component corpus) and accumulating the word form components and the non-split word forms generated by said filtering step in an n-gram language model (C.5.lines 48-59) and determining counts of n-tuple (C.5.lines 54-56-lists the n-tuple sets) sets of word form components and word forms to estimate n-gram probabilities for the n-gram language (C.5.lines 63-65-the counts are n-gram based from the n-tuple sets). Therefore, at the time of the invention it would have been obvious to combine Kanevsky et al. with Kanevsky et al. The motivation for doing so would have been to obtain a corpus of corresponding word forms to components and generate a way to find the probability of the components correctly matching the full word forms without consuming an enormous amount of memory space due to an model which only incorporated the full forms of the word, which would improve the word recognition without substantially increasing the need for data space.

As per **claims 12 and 59**, Kanevsky et al (U.S. Patent No. 6,073,091) and Kanevsky et al. (U.S. Patent No. 5,835,888) disclose all of the limitations of claim 11,

upon which claim 12 depends. Kanevsky et al. (U.S. Patent No. 6,073,091) further discloses:

mapping every word in the corpus into a n-tuple word form component (C.2.lines 19-21).

6. Claims 6 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanevsky et al. (U.S. Patent No. 6,073,091) in view of Karaali et al. (U.S. Patent No. 5,930,754 filed Jun. 13, 1997).

As per **claims 6 and 53**, Kanevsky et al. (U.S. Patent No. 6,073,091) discloses all of the limitations of claim 1, upon which claim 6 depends. Kanevsky et al. does not disclose:

splitting is performed subject to a constraint in which a word that contains a given string of letters is prevented from being split within the string if the string of letters corresponds to one phoneme.

However, as it is well known in the art, Karaali et al. teaches of multiple letters corresponding to a single phone, and in the alignment, not aligning a different phone with the multiple letters. Therefore, at the time of the invention, it would have been obvious to combine Kanevsky et al. with Karaali et al. The motivation for doing so would have been to align corresponding letter pairs with the single phone for the purpose of improving the accuracy of speech recognition due to a well known method of aligning graphemes to phonemes.

Allowable Subject Matter

7. Claims 42-47, and 60 are allowed.

Art Unit: 2654

8. The following is a statement of reasons for the indication of allowable subject matter:

Regarding **claims 42 and 60** as understood by the Examiner, the closest prior art of Kanevsky et al. (U.S. Patent No. 5,835,888) reads on providing a fixed set of allowable endings, including an empty ending (C.3.lines 50-53,C.5.lines 9-13) and providing a fixed set of constraints for splitting words into stems (C.5.lines 10-13), randomly splitting a word to generate an ending from the fixed list of allowable endings (C.5.lines 9-16), defining and storing a stem set containing the stem generated at said splitting and a word set containing the word (C.3.lines 50-53-the table stores the stem and the word), determining possible splits for a word to generate stems and endings therefrom, using the fixed set of allowable endings and the fixed set of constraints (C.5.lines 9-13)

Prior art does not teach nor fairly suggest:

the steps and combination of (c) initializing a split map of words and the corresponding stems and endings by setting a variable t to a predetermined value, and selecting a first word from the fixed vocabulary, (f) determining whether t is less than the size of the vocabulary, obtaining a new word from the vocabulary V, when t is less than the size of the vocabulary, (h) determining possible splits for the new word to generate stems and endings therefrom, using the fixed set of allowable endings and the fixed set of constraints, (i) determining whether there is a split for the new word that generates a previously stored stem of the stem set, (j) splitting the current word into the previously stored stem and an ending of the set of allowable endings, when there is a split for the

Art Unit: 2654

new word that generates the previously stored stem of the stem set, (k) determining whether another previously stored stem in the stem set can be replaced by a new stem generated, when there is no split for the current word that generates the previously stored stem of the stem set, (l) redefining the stem set and the split map to include the new stem generated at (h) in place of the other previously stored stem, when the other previously stored stem can be replaced by the new stem generated at step (h), (m) redefining the stem set to include any new stem into which the current word may be split and extending the split map to include the current word by splitting the new word into the new stem, when the other previously stored stem in the stem set cannot be replaced by the new stem generated at step (h), and (n) incrementing t and returning to step (f) if t is less than the size of the vocabulary V.

Claims 43-47 are allowable as they further limit their parent claims.

9. As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lamont M Spooner whose telephone number is 703/305-8661. The examiner can normally be reached on 8:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nguyen Vo can be reached on 703/308-6728. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2654

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

lms
08/11/04


8-20-2004

NGUYEN T. VO
PRIMARY EXAMINER